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10/577,189

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Kevin E. Gates

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MCDERMOTT, WILL & EMERY LLP

227 WEST MONROE STREET

SUITE 4400

CHICAGO, IL 60606-5096

EXAMINER

BROWN JR, NATHAN H

ART UNIT

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2129

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/577,189

**Applicant(s)**

GATES, KEVIN E.

**Examiner**

NATHAN H. BROWN JR

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE (3) MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☐ Information Disclosure Statement(s) (PTO/SG/US)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**Examiner's Detailed Office Action**

1. This Office Action is responsive to the communication for application 10/577,189, filed January 14, 2008.
2. Claims 1-18 are pending. Claims 1, 7-13 are currently amended. Claims 2-6, 14-18 are original.
3. After the previous office action, claims 1-18 stood rejected.

**Claim Rejections - 35 USC § 101**

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The claims fail to provide a tangible result, and there must be a practical application, by either

- 1) transforming (physical thing) or
- 2) by having the FINAL RESULT (not the steps) achieve or produce a useful (specific, substantial, AND credible), concrete (substantially repeatable/non-unpredictable), AND tangible (real world/non-abstract) result.

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A claim that is so broad that it reads on both statutory and non-statutory subject matter, must be amended. A claim that recites a computer that solely calculates a mathematical formula is not statutory.10577189

5. Claims 1-6, 7-12, and 13-18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims read on a mathematical abstraction and/or algorithm. Independent claims 1, 7, and 13 recite a: method for operating a computational device as a support vector machine, computer software product including a computer readable medium for execution by one or more processors of a computer system, and computational device (respectively):

to define a decision surface separating two opposing classes of a training set of vectors, the method including the steps of: associating a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class; and determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized.

Clearly, the steps used "to define a decision surface separating two opposing classes of a training set of vectors" recite the 101 judicial exceptions of mathematical abstraction and algorithm. Independent claims 1, 7, and 13 are not considered to recite a practical application or recite an abstract idea which, as employed, is embodied in, operates on, transforms, or

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otherwise involves *another* class of statutory subject matter.

Claims 2-6, 8-12, and 14-18 depend from claims 1, 7, and 13

without curing the deficiency of the independent claims.

Therefore, claims 1-6, 7-12, and 13-18 are considered to be non-statutory under 35 U.S.C. 101.

### **Response to Arguments**

6. Applicant's arguments filed January 14, 2008 have been fully considered.

#### Rejection of Claims 1-6, 7-12, and 13-18 Under 35 U.S.C. §101

Applicant argues:

The Examiner has rejected claims 1-6, 7-12, and 13-18 under 35 U.S.C. § 101 contending that the claimed invention is directed to non-statutory subject matter, and in particular, to a mathematical abstraction and/or algorithm. Applicant respectfully traverses the rejection.

Claim 1, as amended herein, is directed to "a computer implemented method for operating a computational device as a support vector machine in order to define a decision surface separating two opposing classes of a training set of vectors." Claim 1 requires a number of processes to be performed on a computational device. As disclosed in ¶0002 of the specification, and as an example, a Support Vector Machine (SVM) is a universal learning machine, that during a training phase, determines a decision surface or "hyperplane". Further, as explained in ¶0057, given that it is desirable to find the maximum margin, and that we can calculate the distance between any two points in the test set, the optimal vectors to preselect as potential support

vectors are those closest to the decision plane. The vectors closest will be the ones with the minimum distance to the opposing class. The method of claim 1 is directed to defining the decision surface separating two opposing classes of a training set of vectors, and therefore produces a useful, concrete, and tangible result.

Claim 7, as amended herein, is directed to a computer readable carrier medium having instructions for execution by one or more processors of a computer system. Claim 1 requires a number of instructions, which when executed by one or more processors of a computer system, perform certain functions and provide an output. For example, claim 7 requires an instruction, when executed, that determines a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. Therefore, under 35 U.S.C. § 101, and the prevailing case law cited above, claim 1 includes a specific "machine" (i. e., one or more processors of a computer system) that executes instructions.

Similarly, claim 13 is directed to a computational device configured to define a decision surface separating two opposing classes of a training set of vectors. The computational device includes one or more processors arranged perform certain functions. For example, claim 13 requires a processor arranged to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. Therefore, under 35 U.S.C. § 101, and the prevailing case law cited above, claim 1 includes a specific "machine" (i.e., a computational device including one or more processors) that executes instructions.

Therefore, Applicant submits that claims 1, 7, and 13 are directed to subject matter patentable under 35 U.S.C. § 101. In addition, claims 2-6, 8-12, and 14-18 depend on claims 1, 7, and 13, respectively and include the limitations of their respective claim. Therefore, Applicants submit that claims 2-6, 8-12, and 14-18 are also directed to subject matter patentable under 35 U.S.C. § 101. 4.

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**Examiner response:**

Where is the useful (specific, substantial, AND credible), concrete (substantially repeatable/non-unpredictable), AND tangible (real world/non-abstract) result?

Examiner does not regard defining a "decision surface separating two opposing classes of a training set of vectors" to be a useful, concrete, and tangible result as no practical application of the vectors or the "opposing classes" is recited. Clearly, what the separating surface represents is abstract, if both the vectors and classes (separated) have no real-world definition. At a minimum, to be statutory under 35 U.S.C. § 101, Examiner expects some real-world problem (e.g., face recognition) to be represented in some measurement data contained in the recited vectors whereby distinct solutions or states of the problem can be discerned in the recited classes. Examiner maintains the rejection of claims 1-6, 7-12, and 13-18 under 35 U.S.C. § 101.

Rejection of Claims 1, 7 and 13 Under 35 U.S.C. §103

Applicant argues:

Rejection of Claims under 35 U.S.C. 103(a) Claims 1, 7 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over an article by Fung et al., "Minimal

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Kernel Classifiers," 2002 (Fung) in view of an article titled "Cluster Analysis," 2001 (CA). Applicant respectfully submits that combination of the cited references is improper, but even if proper, Applicant's invention is patentable over the combination of references.

Applicant respectfully submits that claim 1 is patentable over Fung in view of CA. Claim 1, as amended herein, is directed to "a computer implemented method for operating a computational device as a support vector machine in order to define a decision surface separating two opposing classes of a training set of vectors" The method of claim 1 includes the steps of "associating a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class" and "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized."

Fung is directed to finite concave minimization algorithm for constructing kernel classifiers that use a minimal number of data points for generating and characterizing a classifier. As a preliminary matter, Applicant agrees with Examiner's contention that Fung fails to disclose "associating a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class. CA is directed to a classification method used to arrange a set of cases into clusters such that the cases within a cluster are more similar to each other than they are to cases in other clusters. Both Fung and CA, alone or in combination, fail to teach, disclose, or suggest the step of "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized", as required by claim 1.

Fung requires that the complete training set is used as an initial set selection. In particular, Fung describes that an  $m \times n$  matrix  $A$  is subjected to certain calculations. The entire dataset is reduced to a post-analysis of the selected vectors and subsequent removal of vectors that have a minimal effect on the error when the set is used for classification/regression (See p. 305, ¶2). Conversely, claim 1 requires that the complete training set is



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considered before any support vector calculations are performed (i. e., determining a linearly independent set of support vectors from the training set such that the sum of the distances .associated with the linearly independent support vectors is minimized). This linearly independent set of vectors is selected such that the sum of the distance to the vectors in the opposite class is minimized. Neither Fung nor CA teach, disclose, or suggest this initial reduction of the training set and the subsequent improvements achieved by this approach.

Further, Fung fails to teach, disclose, or suggest minimizing the sum of the distances between opposite class support vectors. Instead, Fung teaches maximizing the margin between two bounding planes. Figure 1 of Fung discloses that data points A+ and A- are separated by a separating surface along with a margin indicated by opposing arrows. Fung teaches that that classification is performed by maximizing the margin 2/11 c0112 as shown in Figure 1 (See Fung, p. 305). As such, Fung fails to teach, disclose, or suggest the step of "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized."

In addition, CA also fails to disclose, teach, or suggest the step of "determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized." As a result, Applicant respectfully submits that claim 1 is patentable over Fung in view of CA. Additionally, claims 2- 6 are dependent on claim 1 and include all of its limitations. Therefore, Applicant respectfully submits that claims 2-6 are also patentable over Fung in view of CA. Similarly, Applicant submits that Claim 7 is patentable over Fung in view of CA.

Claim 7 is directed to a computer readable carrier medium for execution by one or more processors of a computer system. Among other limitations, claim 7 requires instructions to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. For the reasons stated with respect to claim 1, Applicant respectfully submit that Fung and CA, alone or in combination, fail to disclose, teach,

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or suggest instructions to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. Therefore, Applicant submits that claim 7 is patentable over Fung and CA. Further, claims 8-12 depend from claim 7 and include all of its limitations. Thus, Applicant respectfully submits that claims 8-12 are also patentable over Fung and CA. Further, Applicant submits that claim 13 is patentable over Fung in view of CA.

Claim 13 is directed to a computational device configured to define a decision surface separating two opposing classes of a training set of vectors. Among other limitations, claim 13 requires a processor arranged to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. For the reasons stated with respect to claim 1, Applicant respectfully submit that Fung and CA, alone or in combination, fail to disclose, teach, or suggest a processor arranged to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimized. Therefore, Applicant submits that claim 13 is patentable over Fung and CA. Further, claims 14-18 depend from claim 13 and include all of its limitations. Thus, Applicant respectfully submits that claims 14-18 are also patentable over Fung and CA.

Examiner responds:

Examiner finds applicants arguments persuasive and withdraws the rejections of claims 1-6, 7-12, and 13-18 under 35 U.S.C. §103(a).

Conclusion

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan H. Brown, Jr. whose telephone number is 571-272- 8632. The examiner can normally be reached on M-F 0830-1700. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Vincent can be reached on 571-272-

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3080. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nathan H. Brown, Jr.  
April 25, 2008

/David R Vincent/

Supervisory Patent Examiner, Art Unit 2129

**Application Number****Application/Control No.**

10/577,189

**Examiner**

NATHAN H. BROWN JR

**Applicant(s)/Patent under  
Reexamination**

GATES, KEVIN E.

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